



Attorney Docket # 1979

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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In re application of: MA et al.

Group Art Unit: 2827

Serial number: 10/020,638

Examiner: MITCHELL, James

Priority Filing date: 14 DEC 2001

Date RCE: 12 NOV 2002

Title: DUAL CURE B-STAGEABLE UNDERFILL FOR WAFER LEVEL

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Assistant Commissioner for Patents  
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Sir: Claims 1-12 are pending in the application.

Kindly amend claims 1 and 7 as shown below.

Included with this response are a clean version of the amended claims and a marked up version showing changes made of the amended claims.

Support for these amendments can be found in the specification at paragraph [0015].

1. A silicon wafer having a B-stageable underfill material deposited on one face of the wafer, the B-stageable underfill comprising a combination of two chemical compositions,

a first composition that is a liquid, or a solid dissolved or dispersed in a solvent, and

a second composition that is a solid or semi-solid material at room temperature, dispersible or dissolvable either in the first composition if the first composition is a liquid, or in the solvent for the first composition if the first composition is a solid dissolved or dispersed in a solvent,

the second composition having a curing temperature or curing temperature range higher than the curing temperature or curing temperature range of the first composition,

the having curing temperatures or curing temperature ranges sufficiently separated to allow the composition with the lower curing temperature, the first

~~composition, to cure without curing the composition with the higher curing temperature, the second composition,~~

characterized in that the first composition has been cured and the second composition is uncured.

7. A B-stageable underfill composition comprising a combination of two chemical compositions,

a first composition that is a liquid, or a solid dissolved or dispersed in a solvent, and

a second composition that is a solid or semi-solid material at room temperature, dispersible or dissolvable either in the first composition if the first composition is a liquid, or in the solvent for the first composition if the first composition is a solid dissolved or dispersed in a solvent,

the second composition having a curing temperature or curing temperature range higher than the curing temperature or curing temperature range of the first composition,

~~the having curing temperatures or curing temperature ranges sufficiently separated to allow the composition with the lower curing temperature, the first composition, to cure without curing the composition with the higher curing temperature, the second composition.~~

#### REMARKS

The applicants thank the Examiner for indicating that claims 6 and 12 would be allowable if rewritten in independent form.

The Examiner has rejected claims 1 –4 and 7-10 under 35 USC 102(b) as being anticipated by Baker US 5,579,573. Applicants respectfully traverse.

The Examiner states that Baker discloses a wafer having a B-stageable underfill comprising two chemical compositions, epoxy and bismaleimide, which inherently have curing temperatures at ranges sufficiently separate to allow the composition with the lower curing temperature to cure without curing the second composition.

Applicants respectfully take the position that there is no basis for the Examiner's assertion that inherently the curing temperatures of the two

components disclosed in Baker have curing temperatures sufficiently separate to allow one composition to fully cure without curing the other.

Indeed, Baker leads one to the conclusion that the materials cure within the same temperature range. At column 4, lines 7 to 14: "The thermoset material would be dispensed in a liquid unpolymerized state onto the chip surface away from the electrical interconnects. However, a subsequent heating step is necessary to partially react the material into a "B-stageable" thermoplastic-like material, capable of reflowing and curing into a ternary matrix upon additional exposure to heat and pressure."

As stated in the background section of the instant application, paragraph [0011], B-staging has occurred in the prior art in two ways: "If the starting underfill material is a solid, the solid is dispersed or dissolved in a solvent to form a paste and the paste applied to the wafer. The underfill is then heated to evaporate the solvent, leaving a solid, but uncured, underfill on the wafer. If the starting underfill material is a liquid or paste, the underfill is dispensed onto the wafer and heated to partially cure it to a solid state."

Baker suggests that the second method, in which the material is a liquid, is the method used for B-staging that undercoating. Furthermore, there is nothing in Baker to suggest that, if a two material composition is used, the two materials will cure at temperatures with a differential sufficient to allow one to fully cure without curing the other.

Applicants have amended their claims to recite that their underfill is a combination of two compositions, a first composition that is a liquid, or a solid dissolved or dispersed in a solvent, and a second composition that is a solid or semi-solid material at room temperature, dispersible or dissolvable either in the first composition if the first composition is a liquid, or in the solvent for the first composition if the first composition is a solid dissolved or dispersed in a solvent, with the compositions curing at different temperatures.

The Examiner has also rejected claims 5 and 11 under 35 USC 103(a) as applied to claims 4 and 10 in further combination with Todd, US 5,654,081. Applicants respectfully traverse. There is no teaching or suggestion in Todd to use a two composition underfill material with the elements of the instant claims, either alone or in combination with Baker.

Applicants urge the Examiner to the conclusion that with this amendment the claims are now in condition for allowance.

Should the Examiner wish to address any issues by telephone, he is invited to telephone the undersigned attorney.

Respectfully submitted,



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